REMARKS

Reconsideration of this application is respectfully requested in view of the foregoing amendment and the following remarks.

The Applicants express their appreciation to the Examiner for granting the courtesy of a personal interview to Applicants' representative on August 7, 2006.

By the forgoing amendment, claims 1, 7, 12, 18-20, 22, 24 and 29 have been amended and new claims 35 and 36 have been added. Claims 14 and 31 have been previously canceled. Thus, claims 1-13, 15-30 and 32-36 are currently pending in the application and subject to examination.

Interview Summary

In the interview conducted at the USPTO on August 7, 2006, with the Examiner and the Primary Examiner of the instant application, claims 1-13, 15-30 and 32-36 were discussed with respect to ambiguity in the preambles of the independent claims, resulting in the outstanding rejection thereof under 35 U.S.C. § 112, second paragraph. Possible amendments for rendering the claims definite were proposed by the Examiner. The Applicants' representative suggested providing an amended claim set to further prosecution of the application. Such amended claim set is provided above in the listing of the claims. The Applicants appreciate the Examiners' willingness to conduct the interview.

In the outstanding Office Action, claims 1-13, 15-30 and 32-34 were rejected under 35 U.S.C. § 112, second paragraph, as being indefinite. Claims 1, 7, 12, 18-20, 22, 24 and 29 have been amended responsive to this rejection, as discussed in the aforementioned interview.

Regarding whether the converging second model with estimated effective hydraulic pressure is the same as forming the third model by incorporating the second and first models (see, Office Action, p. 8), the Applicant submits that the converging of the second model with the estimated effective hydraulic pressure (output of the first model) is not the same as forming the third model by incorporating the second and first models. Claim 1 has been amended to clarify this feature. The Applicants further submit that, as described at p. 19, line 12 – p. 21, line 13 of the specification, what is intended is to make the structure of the second model (describing the non-linear behavior of the hydraulic actuator) simple, so that it is sufficient if the transfer function of the second model becomes equal to the estimated effective hydraulic pressure obtained by the first model. By making the structure of the second model simple, it becomes possible to shorten the simulation time period to nearly an actual gear shifting time period.

Regarding the means plus function language of claim 7, the Applicants respectfully submit that the means plus function language is disclosed in the specification as filed at p. 30, line 16 – p. 31, line 8, for example.

If any additional amendment is necessary to overcome the rejection under 35 U.S.C. § 112, second paragraph, the Examiner is requested to contact the Applicant's undersigned representative.

In the outstanding Office Action, claims 1-6 were rejected under 35 U.S.C. § 103(a) as being unpatentable over "Object-Oriented Modeling for Gasoline Engine and Automatic Transmission Systems," by K. Hong, et al., 1998 (hereinafter, "Hong") in view of Iizuka (U.S. Patent No. 5,885,188, hereinafter "Iizuka"). Claims 7-34 were rejected

under 35 U.S.C. § 103(a) as being unpatentable over Hong in view of Iizuka and further in view of "Design of Computer Experiments for Open-Loop Control and Robustness Analysis of Clutch to Clutch Shifts in Automatic Transmission" by Albert Yoon et al. (hereinafter, "Yoon"). It is noted that claims 1, 7, 12, 18-20, 22, 24 and 29 have been amended. To the extent that the rejections remain applicable to the claims currently pending, the Applicants hereby traverse the rejections, as follows.

Claim 1

In the Applicants' invention as recited in independent claim 1, as amended, a simulator system includes a control system design tool for a inputting a shift control algorithm and outputting a hydraulic pressure supply command as a pseudo signal, such that the hydraulic pressure supply command is supplied to a hydraulic actuator through a hydraulic circuit based on a shift signal from the shift control algorithm. A first simulator section is connected to the control system design tool for inputting the hydraulic pressure supply command and for estimating an effective hydraulic pressure generated in the hydraulic actuator in response to the hydraulic pressure supply command based on a first model. A second simulator section is connected to the control system design tool and to the first simulator section for determining transfer functions of a second model describing behavior of the hydraulic actuator such that an output of the second model converges with the estimated effective hydraulic pressure. The second simulator section simulates and evaluates the shift control algorithm based on a third model obtained by incorporating the second model with the first model.

In making this rejection, the Office Action admits that Hong fails to disclose a second model describing the behavior of a hydraulic actuator such that the first and

second models converge. However, the Applicants submit that Hong neither discloses nor suggests at least a second simulator section connected to the control system design tool and to the first simulator section for determining transfer functions of a second model describing behavior of the hydraulic actuator such that an output of the second model converges with the estimated effective hydraulic pressure; and a third model obtained by incorporating the second model with the first model, wherein the second simulator section simulates and evaluates the shift control algorithm based on the third model, as recited in claim 1, as amended.

Iizuka is cited as allegedly curing the deficiencies that exist in Hong. However, Iizuka is directed to a shift control method and system for use with an actual automatic transmission in a vehicle being driven. Iizuka discloses a learning control portion 26 within a CPU 13. The Office Action asserts that Iizuka discloses the claimed second simulator section connected to the control system design tool and to the first simulator section for determining transfer functions of a second model describing behavior of the hydraulic actuator such that an output of the second model converges with the estimated effective hydraulic pressure, and third model obtained by incorporating the second model with the first model, wherein the second simulator section simulates and evaluates the shift control algorithm based on the third model, by the learning control portion 26.

However, the learning control portion 26 of Iizuka outputs a "hydraulic pressure correction value" which is determined by calculating a difference between an actual time from initiation of shifting to completion of shifting (actual shifting period) and a target shifting period determined on the basis of a predetermined driving condition.

Iizuka does not simulate anything and thus, has no simulator portion. Similarly, Iizuka has no control system design tool, no first model, no second model, no transfer functions, and no third model. Accordingly, the Applicants submit that Iizuka does not disclose or suggest at least the combination of a second simulator section connected to the control system design tool and to the first simulator section for determining transfer functions of a second model describing behavior of the hydraulic actuator such that an output of the second model converges with the estimated effective hydraulic pressure; and a third model obtained by incorporating the second model with the first model, wherein the second simulator section simulates and evaluates the shift control algorithm based on the third model, as recited in claim 1, as amended.

For at least this reason, the Applicants submit that claim 1 is allowable over the applied art of record. As claim 1 is allowable, the Applicant submits that claims 2-6, which depend from allowable claim 1, are likewise allowable for at least the reasons set forth above with respect to claim 1.

Claim 7

In the Applicants' invention as recited in claim 7, a transmission characteristic analyzing means analyzes characteristics of the transmission when shift is assumedly conducted in accordance with the shift control algorithm through a value to determine deviation of the characteristics from a predetermined standard. A parameter extracting means extracts a parameter having influence on the characteristics when durability of the transmission is degraded. An undesirable shift phenomenon forecasting means conducts simulation based on a model, while changing the parameter and forecasting occurrence of undesirable phenomenon using the value based on behavior change of

the model. An algorithm correcting means corrects the shift control algorithm based on a result of forecasting such that the forecasted occurrence of undesirable phenomenon disappears.

The Office Action asserts that Iizuka teaches a transmission characteristic analyzing means for analyzing characteristics of the transmission when shift is conducted in accordance with the shift control algorithm through a value to determine deviation of the characteristics from a predetermined standard; parameter extracting means for extracting a parameter having influence on the characteristics when durability of the transmission is degraded by "deviation analysis between the actual shifting period and target shifting period" and by 'parameter extraction means' to measure/derive the shift period difference (Iizuka: Col.6 Lines 30-49; Col.5, Lines 46-59). Iizuka `188 teaches that the shifting period have impact on the shift shock and hence durability of the transmission (Iizuka: Col.1, Lines 21-36). Hence parameter extraction means to get the correct shifting period can be extracted from the system (model) based on the learning system (Iizuka: Fig.1, Elements 26-28)." *Office Action,* p. 14.

Thus, the Office Action asserts that the actual shifting period of Iizuka corresponds to the claimed characteristics of the transmission, and the time difference between the actual shifting period and a target shifting period of Iizuka corresponds to the claimed deviation of the characteristics from a predetermined standard. However, the Office Action also interprets the shift period time difference as the claimed parameter that has influence on the characteristics when durability of the transmission is degraded.

The Applicants respectfully submit that the time difference between the actual shifting period and the target shifting period of Iizuka cannot satisfy both the value to determine deviation of the characteristics from a predetermined standard and the parameter that affects the characteristics recited in claim 7

Moreover, according to the Office Action, Iizuka discloses the claimed parameter extracting means at col. 1, lines 21-36 thereof. However, beginning at col. 1, line 20, Iizuka discloses preventing shift shock from increasing due to fluctuation of shifting performance of...due to tolerance in spool valves, springs and so on...However, Iizuka neither discloses nor suggests parameter extracting means for extracting a parameter having influence on the characteristics when durability of the transmission is degraded.

Yoon is not cited for, nor does Yoon cure the deficiencies that exist in the combination of Hong and Iizuka.

Accordingly, the Applicants submit that none of the applied art of record, or combination thereof, discloses or suggests at least the combination of transmission characteristic analyzing means for analyzing characteristics of the transmission when shift is assumedly conducted in accordance with the shift control algorithm through a value to determine deviation of the characteristics from a predetermined standard; parameter extracting means for extracting a parameter having influence on the characteristics when durability of the transmission is degraded; undesirable shift phenomenon forecasting means for conducting simulation based on a model, while changing the parameter and forecasting occurrence of undesirable phenomenon using the value based on behavior change of the model; and algorithm correcting means for correcting the shift control algorithm based on a result of forecasting such that the

forecasted occurrence of undesirable phenomenon disappears, as recited in claim 7, as amended.

For at least these reasons, the Applicants submit that claim 7 is allowable over the applied art of record. As claim 7 is allowable, the Applicants submit that claims 8-11, which depend from allowable claim 7, are likewise allowable for at least the reasons set forth above with respect to claim 7.

Claim 12

In the Applicants' invention as recited in independent claim 12, as amended, a simulator system includes a control system design tool for a inputting a shift control algorithm and outputting a hydraulic pressure supply command as a pseudo signal, such that the hydraulic pressure supply command is supplied to a hydraulic actuator through a hydraulic circuit based on a shift signal from the shift control algorithm. A first simulator section is connected to the control system design tool for inputting the hydraulic pressure supply command and for estimating an effective hydraulic pressure generated in the hydraulic actuator in response to the hydraulic pressure supply command based on a first model. A second simulator section is connected to the control system design tool and to the first simulator section for determining transfer functions of a second model describing behavior of the hydraulic actuator such that an output of the second model converges with the estimated effective hydraulic pressure. The second simulator section simulates and evaluates the shift control algorithm based on a third model obtained by incorporating the second model with the first model. The second simulator section includes transmission characteristic analyzing means for analyzing characteristics of the transmission when shift is assumedly conducted in

accordance with the shift control algorithm through a value to determine deviation of the characteristics from a predetermined standard; parameter extracting means for extracting a parameter having influence on the characteristics when durability of the transmission is degraded; undesirable shift phenomenon forecasting means for conducting simulation based on the third model, while changing the parameter and forecasting occurrence of undesirable phenomenon using the value based on behavior change of the third model; and algorithm correcting means for correcting the shift control algorithm such that the forecasted occurrence of undesirable phenomenon disappears.

In making this rejection, the Office Action admits that Hong fails to disclose a second model describing the behavior of a hydraulic actuator such that the first and second models converge. However, the Applicants submit that Hong neither discloses nor suggests at least the combination of a second simulator section connected to the control system design tool and to the first simulator section for determining transfer functions of a second model describing behavior of the hydraulic actuator such that an output of the second model converges with the estimated effective hydraulic pressure, the second simulator section simulates and evaluates the shift control algorithm based on a third model obtained by incorporating the second model with the first model, wherein the second simulator section includes: transmission characteristic analyzing means for analyzing characteristics of the transmission when shift is assumedly conducted in accordance with the shift control algorithm through a value to determine deviation of the characteristics from a predetermined standard; parameter extracting means for extracting a parameter having influence on the characteristics when durability

of the transmission is degraded; undesirable shift phenomenon forecasting means for conducting simulation based on the third model, while changing the parameter and forecasting occurrence of undesirable phenomenon using the value based on behavior change of the third model; and algorithm correcting means for correcting the shift control algorithm such that the forecasted occurrence of undesirable phenomenon disappears, as recited in claim 12, as amended.

Iizuka is cited as allegedly curing the deficiencies that exist in Hong. However, as noted above, Iizuka is directed to a shift control method and system for use with an actual automatic transmission in a vehicle being driven. Iizuka discloses a learning control portion 26 within a CPU 13. The Office Action asserts that Iizuka discloses the claimed second simulator section connected to the control system design tool and to the first simulator section for determining transfer functions of a second model describing behavior of the hydraulic actuator such that an output of the second model converges with the estimated effective hydraulic pressure, and third model obtained by incorporating the second model with the first model, wherein the second simulator section simulates and evaluates the shift control algorithm based on the third model, by the learning control portion 26.

The learning control portion 26 of Iizuka outputs a "hydraulic pressure correction value" which is determined by calculating a difference between an actual time from initiation of shifting to completion of shifting (actual shifting period) and a target shifting period determined on the basis of a predetermined driving condition.

Iizuka does not simulate anything and thus, has no simulator portion. Similarly, Iizuka has no control system design tool, no first model, no second model, no transfer functions, and no third model.

In addition, as noted above, the Office Action asserts that the actual shifting period of Iizuka corresponds to the claimed characteristics of the transmission, and the time difference between the actual shifting period and a target shifting period of Iizuka corresponds to the claimed deviation of the characteristics from a predetermined standard. However, the Office Action also interprets the shift period time difference as the claimed parameter that has influence on the characteristics when durability of the transmission is degraded.

The Applicants respectfully submit that the time difference between the actual shifting period and the target shifting period of Iizuka cannot satisfy both the value to determine deviation of the characteristics from a predetermined standard and the parameter that affects the characteristics recited in claims 7 and 12.

Moreover, according to the Office Action, Iizuka discloses the claimed parameter extracting means at col. 1, lines 21-36 thereof. However, beginning at col. 1, line 20, Iizuka discloses preventing shift shock from increasing due to fluctuation of shifting performance of...due to tolerance in spool valves, springs and so on... However, Iizuka neither discloses nor suggests parameter extracting means for extracting a parameter having influence on the characteristics when durability of the transmission is degraded.

Yoon is not cited for, nor does Yoon cure the deficiencies that exist in the combination of Hong and Iizuka.

Accordingly, the Applicants submit that none of the applied art of record, or combination thereof, discloses or suggests at least the combination of a second simulator section connected to the control system design tool and to the first simulator section for determining transfer functions of a second model describing behavior of the hydraulic actuator such that an output of the second model converges with the estimated effective hydraulic pressure, the second simulator section simulates and evaluates the shift control algorithm based on a third model obtained by incorporating the second model with the first model, wherein the second simulator section includes: transmission characteristic analyzing means for analyzing characteristics of the transmission when shift is assumedly conducted in accordance with the shift control algorithm through a value to determine deviation of the characteristics from a predetermined standard; parameter extracting means for extracting a parameter having influence on the characteristics when durability of the transmission is degraded; undesirable shift phenomenon forecasting means for conducting simulation based on the third model, while changing the parameter and forecasting occurrence of undesirable phenomenon using the value based on behavior change of the third model; and algorithm correcting means for correcting the shift control algorithm such that the forecasted occurrence of undesirable phenomenon disappears, as recited in claim 12, as amended.

For at least this reason, the Applicants submit that claim 12 is allowable over the applied art of record. As claim 12 is allowable, the Applicant submits that claims 2-6, which depend from allowable claim 12, are likewise allowable for at least the reasons set forth above with respect to claim 12.

For at least these reasons, the Applicants submit that claim 12 is allowable over the applied art of record. As claim 12 is allowable, the Applicants submit that claims 13 and 15-17, which depend from allowable claim 12, are likewise allowable for at least the reasons set forth above with respect to claim 12.

Claims 18, 24 and 19

Claims 18, 24 and 29 recite method claims corresponding to the structure recited in claims 1, 7 and 12, respectively.

Thus, the Applicants submit that claims 18, 24 and 29 are allowable for at least the reasons set forth above with respect to claims 1, 7 and 12, respectively.

Claims 19-23 depend from claim 18, claims 25-28 depend from claim 24, and claims 30, 32-34 depend from claim 29. The Applicants submit that these claims are allowable for at least the reasons set forth above with respect to claims 18, 24 and 29, respectively.

New Claims 35 and 36

The Applicants respectfully submit that none of the applied art of record, nor combination thereof, discloses or suggests at least the combination of a test model hydraulic circuit design model conducting a test to obtain clutch pressure during an assumed shift of the automatic transmission in accordance with the shift control algorithm; a shift simulation model analyzing a result of the test; a simplified hydraulic model having transfer functions determined by the result of the test; a real-time shift simulation model incorporating the simplified hydraulic model with the shift simulation model and determining characteristics inherent to the automatic transmission by evaluating the shift control algorithm through simulation,

extracting parameters having influence on degradation of the automatic transmission, performing and repeating a durability simulation while changing parameters to forecast undesirable phenomenon during shifting, and correcting the shift control algorithm while repeating the durability simulation until the undesirable phenomenon disappear, as recited in claim 35.

Similarly, the Applicants submit that none of the applied art of record, nor combination thereof, discloses or suggests at least the combination of designing a test model hydraulic circuit design model; conducting a test using the test model hydraulic circuit design model to obtain a clutch pressure during an assumed shift of the automatic transmission in accordance with the shift control algorithm; analyzing a result of the test using a shift simulation model; designing a simplified hydraulic model based on the result of the test; designing a real-time shift simulation model by incorporating the simplified hydraulic model with the shift simulation model; conducting a simulation to evaluate the shift control algorithm using the real-time simulation model; analyzing the shift control algorithm and determining characteristics inherent to the transmission using a result of the simulation; extracting from the characteristics parameters having influence on degradation of the transmission; preparing a durability simulation using the real-time shift simulation model; repeating the durability simulation by changing the parameters to forecast undesirable phenomenon during shifting; and correcting the shift control algorithm, while repeating the durability simulation, until the undesirable phenomenon disappear, as recited in claim 36.

Conclusion

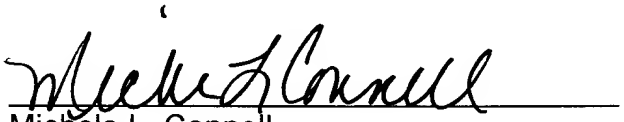
For all of the above reasons, it is respectfully submitted that claims 1-13, 15-30 and 32-36 are in condition for allowance and a Notice of Allowability is earnestly solicited.

Should the Examiner determine that any further action is necessary to place this application into better form, the Examiner is invited to contact the undersigned representative at the telephone number listed below.

In the event this paper is not considered to be timely filed, the Applicants hereby petition for an appropriate extension of time. The Commissioner is hereby authorized to charge any fee deficiency or credit any overpayment associated with this communication to Deposit Account No. 01-2300 referencing client matter number 107101-00034.

Respectfully submitted,

Arent Fox, PLLC



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